REMARKS

The lighting industry has recognized the advantage of utilizing semiconductor devices such as light emitting diodes (LED's) which both save energy and increase the life expectancy of the lighting fixture.

The present invention provides an LED mounting module which includes a substrate that can comprise an inorganic filler and an epoxy resin with the capacity to remove heat. A plurality of individual reflecting members, having a reflecting hole in a position corresponding to the location of each LED device, can be mounted on a main surface of the substrate. The reflecting member utilizes the same resin material as the insulating substrate and the individual reflecting pieces can be subjectively type of positioned with regards to the insulation substrate that cannot only be adhered without an additional step of an adhesive layer, but can eliminate distortion that could be caused by a difference in thermal expansion coefficients between traditional materials forming a reflecting member and a printed wiring board or substrate. See Paragraph 0307.

The advantages that can be realized by these features are set forth, for example, in our specification as follows:

> [0010] Since the substrate and reflecting member are directly adhered to each other in a state that the main surfaces of the substrate and the reflecting member are in contact, nothing is provided between the substrate and the reflecting member (strictly speaking, minute voids and the like may be found). In addition, the substrate and reflecting member are adhered to each other without using an adhesive layer or the like. In other words, the substrate and reflecting member are adhered by making use of the resin material forming the reflecting member.
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> [0012] Here, the substrate includes an insulation board made of a resin material, and a wiring pattern on one of main surfaces of the insulation board, and the resin material forming the insulation board contains a same resin as the resin material forming the reflecting member. Here, the resin material may be a thermosetting resin material or thermoplastic resin material.

In addition, the resin material for both the insulation board and the reflecting members, can include fillers to improve the reflecting efficiency.

> [0015] Here, the [reflection member] fillers include at least one of TiO_2, SiO_2, $A1_2O_3$, and $BaSO_4$, and the resin material forming the insulation board contains at least one of $A1_2O_3$, A1N, SiO_2, and SiC.

As can be appreciated, the reflecting members and the substrate are composed of substantially the same resin materials such as an epoxy resin that can be adhered together in a strong manner without a separate adhesive layer required between the member and the substrate. See Paragraph 0197.

These features are now set forth in our amended Claim 1 and newly drafted Claim 28. Additionally, dependent Claim 2 defines advantages of the reflecting member and insulation board, each including fillers, using substantially the same resin materials.

Finally, the newly drafted Claim 28 also defines the use of fillers, with the reflector member strongly bound to the substrate on one surface while on another surface a metal board is layered.

By utilizing substantially the same resin materials for the reflecting member and the substrate, they can be adhered together in a relatively simple production procedure. As a result, any difference of thermal expansion between the reflecting member and the substrate caused by the heat of the LED devices can be reduced, since the linear expansion coefficients of the reflecting member and the substrate will be the same.

Additionally, when the reflecting member is made of a resin material and a wiring pattern is formed on the substrate, the reflecting member can be directly adhered to the substrate without insulating the wiring pattern.

An additional advantage of the present invention is set forth in dependent Claim 2, whereby an enhancement of the reflectance of not only the substrate, but also the reflecting member by adding fillers is accomplished. Accordingly, light emitting from the LED device directed towards either the surface of the substrate and the reflecting hole of the reflecting member, can be equally reflected so that the light extraction efficiency can be enhanced.

The use of the fillers, which can be the same for both the substrate and the reflecting member, will create a reflective surface since the fillers will cloud any transparency of the epoxy resin, and thereby prevent or minimize light adsorption while further assist in dissipation of any heat. Accordingly, a resin material on both the respective substrate and reflecting member will not deteriorate or change in color due to the temperature and, thereby, it is possible to prevent a lowering of the reflectance of the LED module over the life cycle of the device.

Finally, as set forth in Claim 28, the addition of not only the same type of epoxy resin for the reflecting member and the substrate is set forth along with the filler material while the addition of the metal board, which is layered on the other surface of the substrate, adds an additional feature and any warpage of the substrate can be suppressed to thereby enable a high quality LED mounting module to be obtained.

The Office Action rejected Claims 1-5 as being anticipated by *Suehiro et al.* (U.S. Patent Publication 2002/0001192).

> "[A]nticipation by inherent disclosure is appropriate only when the reference discloses prior art that must *necessarily* include the unstated limitation. . . ."
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> *Transclean Corp. v. Bridgewood Services, Inc.,* 290 F.3d 1364, 62 USPQ2d 1865 (Fed. Cir. 2002)

The *Suehiro et al.* reference taught a pair of metal layers provided on the upper and lower surfaces of an insulating base member, with an LED chip array mounted on a top surface. The LED chip array could, for example, include a pair, respectively, of red and green LED's with a single blue LED combined together to provide a white light source for backlighting or frontlighting a liquid crystal display panel.

Purportedly, heat generated from a plurality of such light emitting elements would be directly released from the metal layer on the upper surface and on the lower surface, directly into the air. See Paragraph 0013.

The substrate referred to in the *Suehiro et al.* reference was a printed board providing leads connected to the first and second electrodes, plus a substrate having a lead frame structure formed by placing a lead frame within a mold and then eventually pouring material into the mold. See Paragraph 0015.

The printed circuit board included a base 2 as shown in Figure 7B of a glass epoxy resin with a white colorant. The case 4, which is alleged to be our equivalent reflecting member, actually accommodates the five LED's and is formed of a polyphthalamite resin as set forth in Paragraph 0050. The Office Action contended that the "reflecting hole" was placed in position to correspond into each of the LED devices and was mounted on the main surface of the base 2. Applicant, however, respectfully traverses the contention that the case 4 and the insulating base 2 of the printed circuit board are directly adhered by the respective paragraphs cited on Page 3 of the Office Action relative to the Figure 7B, since it does not support this contention.

Paragraph 0060 of the *Suehiro et al.* reference states as follows:

> [0060] FIG. 4 shows an assembly comprising the light emitting device 1 and the backlight apparatus 20. In incorporating the light emitting device 1 and the backlight apparatus 20 into the illustrated assembly, the light

> emitting device 1 is first mounted on the light emitting device mount substrate 21. A wiring pattern 22, provided on the surface 21a of the light emitting device mount substrate 21, connects to the connections $6R_2$, $6G_2$, $6C_2$ of the light emitting device 1, for example, by using a solder 13. Next, an adhesive or epoxy can bond the case 4 to the upper surface 2a of the printed circuit board 2A, for example, and thereafter the filling member 5 fills the inside of the opening 4a and hermetically seals the LEDs 3R, 3G, 3B in the case 4. The light guide section 23 of the backlight apparatus 20 is mounted onto the light emitting device mount substrate 21. (Underline added)

Thus, an adhesive or an epoxy bonds the case 4 to the upper surface 2a of the printed circuit board 2A, and thereafter a filling member 5 fills the inside of the opening 4a and hermetically seals the LED's 3R, 3G and 3B.

In summary, the present invention, as set forth in our amended claims, is significantly different in a relatively crowded field. The *Suehiro et al.* reference utilizes different resin materials for its case 4 and the printed circuit base 2. Additionally, the case 4 and the printed circuit board are adhered together by an adhesive layer. The case 4 is not designed for an individual reflecting piece, but rather is disclosed to collectively mount at least five LED's which extend substantively across the printing circuit board. The printed circuit pattern is designed to be exposed for direct transmission of heat into the air. The part of the lower surface of the reflecting member 4 is adhered to the substrate. The printed circuit board 2 via the wiring patterns, that is, the electrode faces 6B1 and 6C1 as shown in Figure 7B.

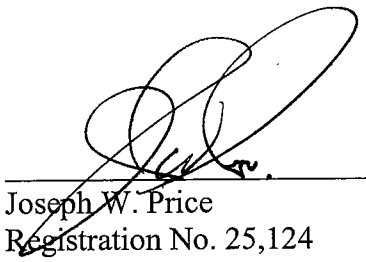
Needless to say, it does not teach individual reflecting members nor the same epoxy resin and relies upon an adhesive layer for adhering the case 4 onto the surface of the printed circuit board 2.

It is believed that the present claims more than adequately distinguish over the art of record in this relatively crowded field to provide a significant improvement which should be recognized with a patent.

If the Examiner believes a telephone interview will help further the prosecution of this case, he can contact the undersigned attorney at the listed telephone number.

Very truly yours,

SNELL & WILMER L.L.P.



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